Berkeley Lab and the Clean Energy States Alliance

CASE STUDIES OF STATE SUPPORT FOR RENEWABLE ENERGY

The Impact of State Clean Energy Fund Support for Utility-Scale Renewable Energy Projects

Mark Bolinger, Ryan Wiser, Garrett Fitzgerald
Lawrence Berkeley National Laboratory

CONTENTS

October 2004

The database from which the information in this report has been compiled can be found at http://eetd.lbl.gov/ea/ems/cases/Large_Renewables_Database.xls

Download other clean energy fund case studies from:

http://eetd.lbl.gov/ea/EMS/cases/

or

www.cleanenergystates.org

Introduction

Fourteen states across the U.S. have established funds to promote the development and commercialization of renewable energy technologies. Most often financed by a small surcharge on retail electricity rates, these funds currently collect more than $300 million per year in aggregate in support of renewables. At this funding level, state clean energy funds are positioned to be a major driver of renewable energy development.

While state clean energy funds have pursued a variety of approaches in the use of their funds, support for the deployment of utility-scale renewable energy projects – such as commercial wind, biomass, and geothermal generation projects – has been a principal target of most funds. This case study, and the database it describes, summarizes the support that clean energy funds have provided to utility-scale renewable energy projects in recent years, detailing – among other things – the amount of funds obligated and the number, capacity, and resource type of projects supported by state funds.

This case study focuses on projects supported by funds that are members of the Clean Energy States Alliance (CESA). CESA is a non-profit, membership-based, multi-state coalition consisting of most of the clean energy funds throughout the United States. CESA provides information and technical assistance to its member funds, and works with them to develop and promote clean energy technologies and to create and expand the markets for these technologies.

The database on which this summary is based will be updated periodically to provide a running summary of state activity and influence. The Microsoft Excel database specifically contains information on all non-photovoltaic, utility-scale (defined here as 1 MW or larger in nameplate capacity), *new* renewable energy projects (whether currently on line or not) that have received (or been obligated) construction- or production-related financial support

from CESA-member clean energy funds.[1] The database includes both project and incentive information, to the extent readily available. Project information includes: project location, resource type (e.g., wind, geothermal, etc.), nameplate capacity, project participants (e.g., developer/owner), project status (i.e., on-line, pending, or cancelled), on-line date (if applicable), and power purchase agreement (PPA) counterparty (if applicable). Incentive information includes: supporting clean energy fund, incentive type (e.g., grant vs. production incentive vs. loan), original and revised incentive amount, date of incentive award, solicitation name (if any), and treatment of the project's tradable renewable certificates (TRCs – i.e., whether the fund places any restrictions on the sale of TRCs from the project). Finally, in addition to reporting the incentive as it is actually structured, we also normalize all incentives (where possible) to their equivalent 5-year production incentive in order to facilitate broad comparisons across projects, technologies, and clean energy funds.

The remainder of this report provides summary information compiled from the database as of September 2004. For more detailed information on individual states or projects, see the actual database itself, which can be accessed at http://eetd.lbl.gov/ea/ems/cases/Large_Renewables_Database.xls.

Key Findings

1. State clean energy fund support for utility-scale renewable energy projects is significant.

As shown in Table 1 and Figure 1, clean energy funds in eight states originally set aside or obligated more than $399 million in construction or operational support for 163 projects totaling 2,288 MW. After accounting for project cancellations – 8 projects totaling 32 MW have been cancelled to date – and penalties due to missed milestones, the total amount of funding currently obligated stands at $345 million. So far, 56 projects totaling 707 MW have been built, while 99 projects totaling 1,548 MW are still in the development pipeline.

2. California has taken the lead, but other states have provided substantial funding.

Among the states listed in Table 1, California clearly dominates, accounting for *more than half* of total dollars obligated, as well as capacity obligated, on-line, and pending. This not only reflects the sheer size of California's renewable energy program, at roughly $135 million per year, but also its early initiative: California's first auction of production incentives to utility-scale renewable energy projects occurred in June 1998, roughly two years prior to similar activity in other states. By the same token, however, California has not encumbered new funding for such projects since 2001, while much of the activity in other states is more recent.

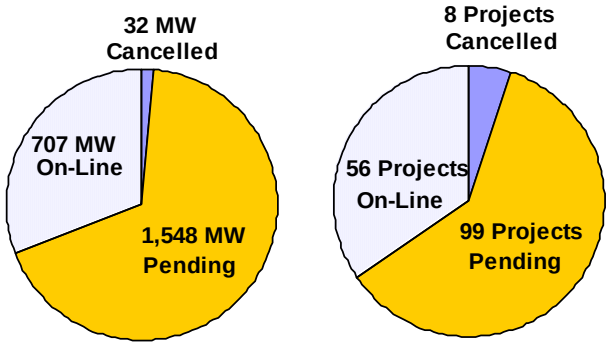

Figure 1. Status of Projects and Capacity Supported

[1] To be clear, the database does *not* include projects that have received only pre-development support; nor does it cover R&D or other non-deployment activities.

Table 1. Summary of State Support for Utility-Scale Renewable Projects (as of September 2004)

Project Location	# of Projects	Original Dollars Obligated ($)	Current Dollars Obligated ($)	Capacity Obligated (MW)	Capacity Cancelled (MW)	Capacity Pending (MW)	Capacity On-Line (MW)
CA	60	$243,573,376	$193,019,993	1,285.3	30.6	830.1	424.5
IL	4	$9,305,000	$9,305,000	101.6	0.0	51.2	50.4
MA	4	$19,469,093	$19,469,093	49.6	0.0	49.6	0.0
MN	68	$61,841,977	$61,841,977	124.9	1.7	91.7	31.5
NH*	1	$2,378,930	$2,378,930	50.0	0.0	50.0	0.0
NJ	5	$14,590,000	$14,590,000	41.1	0.0	41.1	0.0
NY	12	$26,560,000	$26,560,000	325.2	0.0	283.6	41.6
OR	1	$3,800,000	$3,800,000	41.0	0.0	0.0	41.0
PA	8	$17,600,000	$14,000,000	269.6	0.0	151.1	118.5
Total	**163**	**$399,118,376**	**$344,964,993**	**2,288.1**	**32.3**	**1,548.4**	**707.4**

*New Hampshire does not currently have a clean energy fund. The single project located in New Hampshire is receiving support from Massachusetts' clean energy fund.

3. The amount of renewable generating capacity supported by state funds continues to increase.

As shown in Figure 2, with the exception of 1999 and so far in 2004, the amount of renewable generating capacity being supported by these eight states has risen steadily each year. Likewise, the amount of obligated capacity that has come on-line has also steadily risen, with proportionally larger increases in 2001 and 2003 – both years in which the federal production tax credit (PTC) for wind power expired, thereby encouraging completion of wind projects prior to year's end.

4. Some development difficulties have been encountered.

It is also apparent from Figure 2 that the amount of obligated capacity coming on-line has not kept pace with the amount of new capacity being obligated funds: the gap between the two currently stands at 1,581 MW, its widest point to date (again, as shown in Table 1, 32 MW of this amount has been cancelled or withdrawn, leaving 1,548 MW still pending). This is partly a reflection of unforeseen difficulties in the development process, such as permitting challenges and securing a power purchase agreement. The lull to date in 2004, moreover, is in large part reflective of the expiration of the PTC at the end of 2003, and the failure of Congress to reinstate the credit until September 2004.

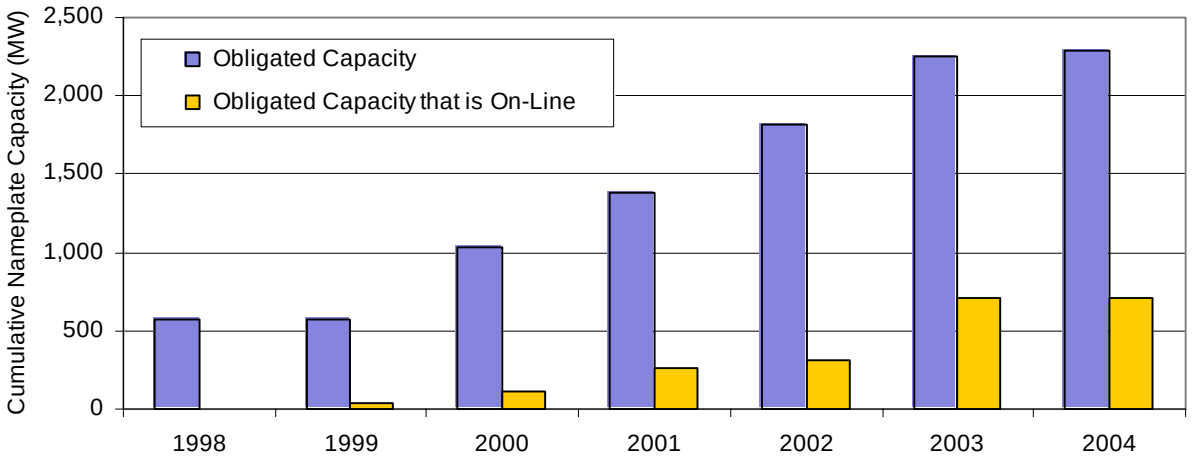

Figure 2. Cumulative Renewable Capacity Obligated and On-Line Over Time

5. Wind energy is a major recipient of financial support.

Having captured around 60% of total funding to utility-scale renewable projects, wind power accounts for more than 80% of all obligated, on-line, and pending capacity. As shown in Table 2, 568 MW of obligated wind capacity is on-line, and more than 1,300 MW is still pending. This high concentration reflects the cost-effectiveness and widespread availability of wind power. The next largest resource (in terms of funding and capacity) is geothermal, which has been supported by a single state – California. Landfill gas projects have also been somewhat successful at securing state incentives, though a relatively high number of such projects have since been cancelled.

Figure 3 shows the cumulative amount of obligated capacity that has come on-line over time, by resource type.

Table 2. Support for Utility-Scale Renewable Projects, by Resource Type (as of September 2004)

Resource Type	# of Projects	Original Dollars Obligated ($)	Current Dollars Obligated ($)	Capacity Obligated (MW)	Capacity Cancelled (MW)	Capacity Pending (MW)	Capacity On-Line (MW)
Biomass	8	$15,406,770	$11,466,832	85.2	9.5	64.4	11.3
Digester Gas	3	$4,108,210	$4,108,210	6.0	0.0	3.9	2.1
Geothermal	4	$80,331,618	$80,331,618	156.9	0.0	97.9	59.0
Hydro	7	$12,977,258	$11,787,988	45.7	0.0	14.5	31.3
Landfill Gas	28	$38,108,552	$31,098,469	90.7	19.8	35.1	35.8
Waste Tire	1	$7,232,413	$3,287,461	30.0	0.0	30.0	0.0
Wind	112	$240,953,555	$202,884,417	1,873.6	3.0	1,302.6	568.0
Total	**163**	**$399,118,376**	**$344,964,993**	**2,288.1**	**32.3**	**1,548.4**	**707.4**

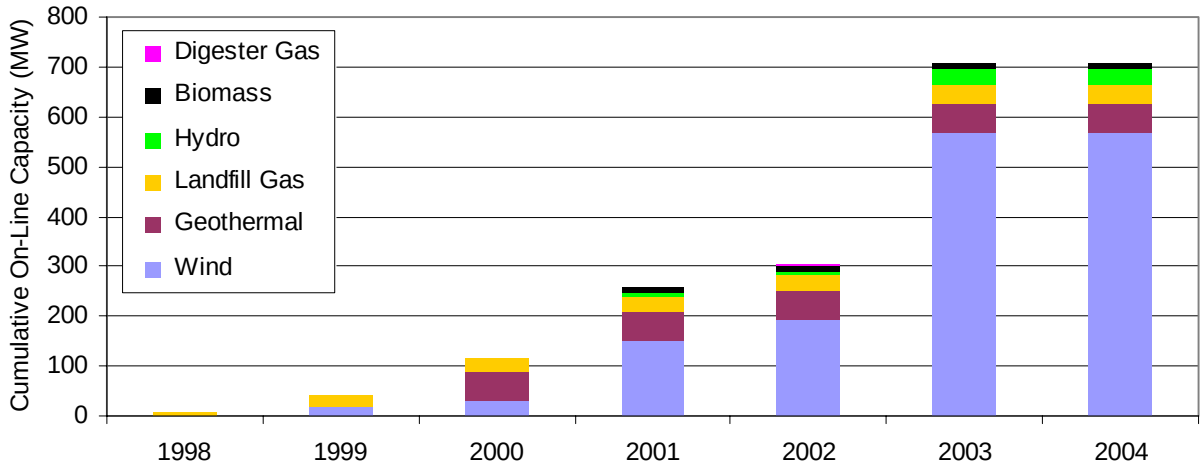

Figure 3. Cumulative On-Line Capacity Supported by CESA-Members, by Renewable Resource

6. States are increasingly using new and innovative incentive structures to support projects.

The structure of state clean energy fund support for utility-scale renewable energy projects has generally evolved over time. In the late 1990s, production incentives and grants were the predominant form of support. While both are still regularly employed,[2] a number of states have begun to expand their offerings to include debt financing, negotiated purchases of a project's tradable renewable certificates (TRCs), and "insurance" products that mitigate the project's price risk in the absence of a long-term power purchase agreement.

Figure 4 shows the prevalence of each type of incentive employed, based on percentage of total dollars obligated. As shown, real-time production incentives – utilized in California, Minnesota, New Jersey, New York, and Pennsylvania – account for 82% of all dollars obligated. Another 4% involves a variation on real-time production incentives, where instead of metering out funding over time, funding is provided up-front in a lump sum, but *earned* over time through electricity production or delivery of TRCs. Pennsylvania, Oregon, and Illinois have each employed this type of incentive. Massachusetts has recently offered various forms of TRC price insurance, accounting for 5% of all dollars obligated. Meanwhile, Pennsylvania and Illinois have provided debt financing equal to about 2% of all dollars obligated. Finally, grants in Illinois, Minnesota, New York, and New Jersey make up the remaining 7% of dollars obligated.

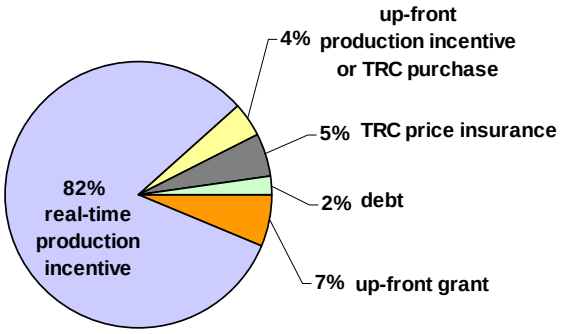

Figure 4. Percentage of Obligated Dollars Awarded Through Various Incentive Types

[2] States are becoming increasingly innovative in their use of grants and production incentives. For example, some states have provided an up-front, lump-sum, production incentive that is earned over time and secured by a letter of credit. Such an incentive provides similar value to the project as an up-front grant, without negatively impacting the project's ability to capture the federal production tax credit.

7. Support is predominantly production-based, rewarding electricity generation rather than project construction.

In aggregate, incentives that are based on actual production make up 91% of all dollars obligated (i.e., 82% real-time production incentive plus 4% up-front production incentive or TRC purchase plus 5% TRC price insurance). More so than grants, such production-based incentives better align the interests of the project developers, the state funds, and society in building or supporting projects that efficiently produce the maximum amount of clean, renewable energy. Just as importantly, unlike grants, production-based incentives are unlikely to trigger the anti-double-dipping provisions of the federal production tax credit (PTC) for wind contained in Section 45 of the US tax code. Given that wind power accounts for more than 80% of the utility-scale renewable capacity supported by these funds, how different incentive types interact with the PTC is an important issue.

8. Normalized incentive levels vary based on a number of factors.

Figure 5 shows the normalized (to 5-year production incentive equivalent) range of support for each renewable resource.[3] Incentive levels have ranged widely, particularly for wind, hydro, and biomass projects. In each of those cases, however, the capacity-weighted average normalized incentive falls close to the low end of the range, implying that there is not much capacity at the high end of the range. Typically, the high end of the range represents very small projects that have been able to secure generous incentives, perhaps justified by the disproportional impact of transaction costs and diseconomies of scale that small projects must sometimes overcome.

Although sample size (in terms of both number of projects and capacity involved) varies widely across resources, the ranking of resources based on capacity-weighted average normalized incentive level is not too surprising. Specifically, landfill gas and wind projects have required some of the lowest incentives on average, while digester gas and biomass projects have typically required more support.

[3] Note that projects supported by debt financing or TRC price insurance are not included in Figure 5, due to difficulties in normalizing such incentives (e.g., calculating the value of a "put" option on a project's TRCs, or the value of subsidized financing). As such, Figure 5 excludes 7% (per Figure 3) of all dollars obligated.

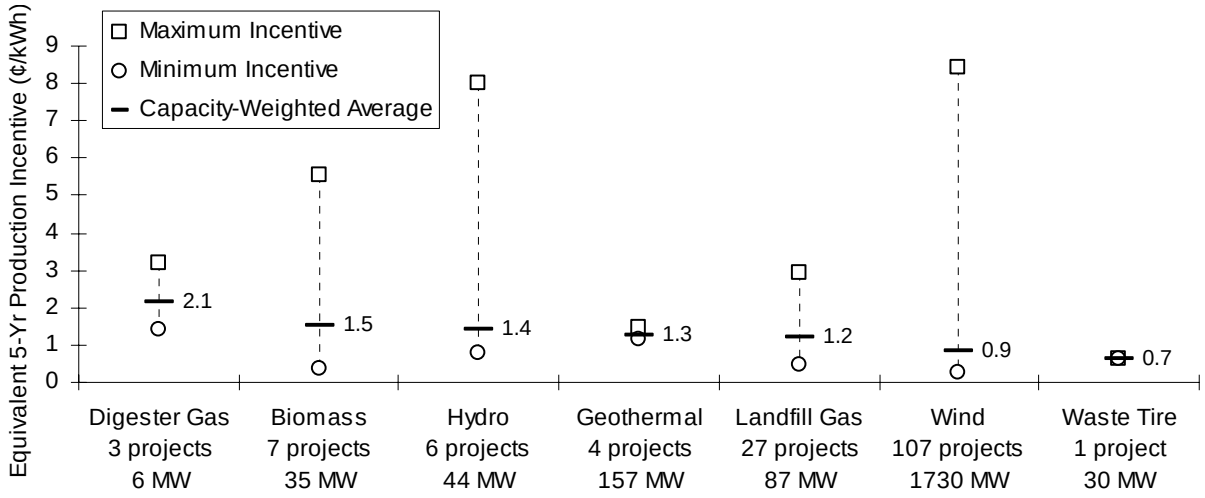

Figure 5. Equivalent 5-Year Production Incentives by Resource Type

Conclusions

To date, CESA-member state clean energy funds have committed a substantial amount of funding in support of utility-scale (> 1 MW) renewable energy projects. This funding, currently about $344 million, is already supporting 707 MW of new renewable capacity, and could eventually support up to 2,255 MW (i.e., 1,548 MW of obligated capacity still remains in the development pipeline). California has by far provided the most support of any fund, while wind has by far received the most support of any renewable resource. Other state funds, however, are also supporting such projects (in some cases at similarly aggressive levels as California relative to the total size of endowment), and other renewable resources are also garnering attention and funding. Progress in obligating funds for new projects, and in bringing previously obligated projects on-line, has been steady over time, though perhaps slower than originally envisioned with respect to development and construction. State funds are experimenting with increasingly innovative financial incentives, ranging from production incentives provided in an up-front lump sum and then earned over time, to subordinated debt financing, to options and other forms of price insurance on a project's TRCs. Finally, while the amount of financial support provided to individual projects has varied widely, on average the level of incentive provided to projects to date does not appear to be unreasonable.

The database from which this information has been compiled is publicly available at http://eetd.lbl.gov/ea/ems/cases/Large_Renewables_Database.xls, and will be updated periodically as new funding is obligated and new projects come on-line.

INFORMATION SOURCES

Bolinger, M. 2004. *A Survey of State Support for Community Wind Power Development*. LBNL-54715. Berkeley, Calif.: Lawrence Berkeley National Laboratory. http://eetd.lbl.gov/ea/ems/cases/community_wind.pdf

Bolinger, M. 2002. *Use of Low-Interest, Subordinated Debt to Finance a Wind Project in Pennsylvania*. LBNL-51514. Berkeley, Calif.: Lawrence Berkeley National Laboratory. http://eetd.lbl.gov/ea/ems/cases/Subordinated_Debt.pdf

Bolinger, M. and R. Wiser. 2002. *Utility-Scale Renewable Energy Projects: A Survey of Clean Energy Fund Support*. LBNL-49667. Berkeley, Calif.: Lawrence Berkeley National Laboratory. http://eetd.lbl.gov/ea/ems/reports/49667.pdf

Bolinger, M. and R. Wiser. 2002. *Production Incentive Auctions to Support Large-Scale Renewables Projects in Pennsylvania and California*. LBNL-51511. Berkeley, Calif.: Lawrence Berkeley National Laboratory. http://eetd.lbl.gov/ea/ems/cases/Production_Incentives.pdf

Bolinger, M., R. Wiser, L. Milford, M. Stoddard, K. Porter. 2001. *Clean Energy Funds: An Overview of State Support for Renewable Energy*. LBNL-47705. Berkeley, Calif.: Lawrence Berkeley National Laboratory. http://eetd.lbl.gov/ea/ems/reports/47705.pdf

Fitzgerald, G., R. Wiser, M. Bolinger. 2003. *The Experience of State Clean Energy Funds with Tradable Renewable Certificates*. LBNL-54137. Berkeley, Calif.: Lawrence Berkeley National Laboratory. http://eetd.lbl.gov/ea/EMS/cases/TRC_Case_Study.pdf

Wiser, R. 2002. *An Open-Ended Renewables RFP in Minnesota Funds Biomass and Innovative Wind Applications*. LBNL-51513. Berkeley, Calif.: Lawrence Berkeley National Laboratory. http://eetd.lbl.gov/ea/EMS/cases/Minnesota.pdf

Database of Utility-Scale Renewable Energy Projects Supported by CESA Members: http://eetd.lbl.gov/ea/ems/cases/Large_Renewables_Database.xls

ABOUT THIS CASE STUDY SERIES

A number of U.S. states have recently established clean energy funds to support renewable and clean forms of electricity production. This represents a new trend towards aggressive state support for clean energy, but few efforts have been made to report and share the early experiences of these funds.

This paper is part of a series of clean energy fund case studies prepared by Lawrence Berkeley National Laboratory and the Clean Energy States Alliance. The primary purpose of this case study series is to report on the innovative programs and administrative practices of state (and some international) clean energy funds, to highlight additional sources of information, and to identify contacts. Our hope is that these brief case studies will be useful for clean energy funds and other stakeholders that are interested in learning about the pioneering renewable energy efforts of newly established clean energy funds. To access or download all the case studies, see: http://eetd.lbl.gov/ea/ems/cases/ or http://www.cleanenergystates.org/

ABOUT THE CLEAN ENERGY STATES ALLIANCE

The Clean Energy States Alliance (CESA) is a non-profit initiative funded by members and foundations to support the state clean energy funds. CESA collects and disseminates information and analysis, conducts original research, and helps to coordinate activities of the state funds. The main purpose of CESA is to help states increase the quality and quantity of clean energy investments and to expand the clean energy market. The Clean Energy Group manages CESA, while Berkeley Lab provides CESA with analytic support.

CONTACT THE MANAGERS OF THE CASE STUDY SERIES

Ryan Wiser
Berkeley Lab
1 Cyclotron Rd., MS90-4000
Berkeley, CA 94720
510-486-5474
rhwiser@lbl.gov

Mark Bolinger
Berkeley Lab
105 North Thetford Road
Lyme, NH 03768
603-795-4937
mabolinger@lbl.gov

Lewis Milford
Clean Energy Group
50 State Street
Montpelier, VT 05602
802-223-2554
lmilford@cleanegroup.org

FUNDING ACKNOWLEDGEMENTS

Berkeley Lab's contributions to this case study series are funded by the Clean Energy States Alliance, and by the U.S. Department of Energy (the Assistant Secretary of Energy Efficiency and Renewable Energy, as well as the Office of Electric Transmission and Distribution, Electric Markets Technical Assistance Program) under Contract No. DE-AC03-76SF00098. The Clean Energy Group's efforts in connection with this work and related activities are funded by the Clean Energy States Alliance, and by the Surdna Foundation, the Rockefeller Brothers Fund, the Oak Foundation, The John Merck Fund, and The Emily Hall Tremaine Foundation.

DISCLAIMER